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ROYAT

DR. G. H. BRANDT

SECOND EDITION.

GENERAL VIEW OF THE ESTABLISHMENT AND PARK AT ROYAT LES BAINS.

With the Author's Compliments.

ROYAT

(LES BAINS)

IN AUVERGNE

ITS

MINERAL WATERS

AND

CLIMATE

BY

G. H. BRANDT, M.D.

SECOND EDITION

LONDON
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PREFACE.

THE favourable manner in which the first edition of my work on the Baths of Royat was received has encouraged me to publish a new edition. Since the publication of the first edition I have had extensive opportunities of testing the accuracy of the modes of treatment therein enunciated. The clinical cases which I have added to the new edition are examples of the results of the treatment pursued in other similar cases at Royat.

Each year both the medical profession and the public become more alive to the value of Hydrotherapeutics, I trust that I may have aided in advancing the study of so important a branch of Medicine.

G. H. BRANDT.

Royat-les-Bains.

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ROYAT.

INTRODUCTION.

FIVE years of practical experience in the treatment of cases sent to me at Royat, enables me to accomplish a promise, made to many of my colleagues, who have kindly entrusted their patients to my care, of supplying them with exact information as regards the cases most appropriate for treatment at these springs. I am anxious to do so, as so many Practitioners are often misguided by the numerous pamphlets which are distributed among them, and in which the mineral waters are said to cure *especially* everything: such a state of things is not only confusing, and misleading in practice, but is the surest method of discrediting that which is really beneficial if properly classified. I believe almost all our ailments can be modified, and often cured by

the proper use of natural mineral waters at the spring, but to obtain any real result, it is indispensable to study the nature of the case, the qualities of the water, and the proper way of using it. If this method is scientifically carried out, we must meet with certain results, otherwise, if we go on the haphazard system, we must look for failures, and disappointment. I shall therefore in the course of this work, besides giving a general view of the place, and its special arrangements for treatment, insist on the importance of a proper selection of cases for such treatment, and also present a few observations on arthritism, as examples of the varieties of affections having a gouty basis. One or two remarks on the after cure may also be acceptable. Should I succeed in conveying to the mind of my colleagues, who have no time for making a special study of the mineral water cure, a concise idea of the value of these waters in their special adaptation to a certain class of disease; I shall have the satisfaction of believing that I have rendered them a slight service, not only in saving their time, but also enabling them to give a more positive answer

to their enquiring patients, and it will be no small pleasure to them to find after their return, that they have had the right medicine prescribed, and that they have been sent to the proper place to have it administered.

I have so frequently heard of disappointments, failures, and grumblings, at having been sent to the wrong place, that a warning of this kind may be truly beneficial to both physician, and patient, and it is always satisfactory to know that we have done the right thing, and that our patients are satisfied, and benefited.

ROYAT.

The mineral springs of Royat are situated in the bed of a charming valley leading from Clermont-Ferrand to the Puy-de-Dome, at a height of 1480 feet above the level of the sea, and two miles distant from the chief town of the Puy-de-Dome Department, one of the principal stations on the Paris, Lyon, and Mediterranean railway line.

The access is therefore easy, and it takes about nine hours from Paris. Anyone with a moderate knowledge of geology, will soon find that he is in the midst of extinct volcanoes, and surrounded by mineral waters which spring amidst those wonderful eruptions: of all the departments of France the Puy-de-Dome certainly offers the most varied collection of volcanic remains. A very remarkable fact is, that we owe the first complete scientific description of this region to the pen of an English geologist, Poulett Scrope. This province was occupied for centuries by the Romans, who lived in a high state of civilization, as attested by the marvellous traces they have left behind them. Their knowledge and experience of mineral waters must have been great, if we can judge by the magnificent remains of their work, for we see scattered all over France, Spain, and Portugal wonderful marks of science, art, and industry, which even at the present time attract our attention, and command our admiration. Among all these remains of Roman work, those which interest the medical man, and claim his particular attention, are the establishments for mineral baths,

which abound in this part of France, and which deserve a special study, owing to their peculiar virtues, and to the benefits they are daily affording to suffering humanity.

ROYAT SPRINGS.

The four mineral springs at Royat, although of the same type—chloro-alkaline—differ as to their mineralisation, and their temperature: the presence of chloride of sodium and other salts show a marked difference from the purely alkaline waters, of which we might quote as types, Vals and Vichy.

The salts of soda, potash, lime, and lithia, represent in these waters the alkaline elements, the depressing effects of which are counteracted by the tonifying properties of the salts of iron, and arsenic, which combined with the stimulating effects of their carbonic acid, renders them so powerful and active.

The four springs bear the name of Eugénie, César, Saint Mart, and Saint Victor. The follow-

ing tables of analysis recently made by Mons. Willm, a distinguished chemist attached to the Laboratory of the School of Medicine at Paris, will show at a glance the composition of each of the sources, with their temperature and quantity. The result of another analysis of three springs made by Mons. A. Carnot, Director of the Laboratory of the School of Mines at Paris, so as to obtain the correct amount of arsenic contained in them will be seen in Table II.

EUGÉNIE SPRING.

This spring is the largest, hottest, and most mineralised of the four springs; it throws up in huge bubbles 1,000 Litres (*Quarts*) of water per minute, and constitutes the main supply to the swimming and still baths, the steam for inhalation, the spray for aspiration, and the different douches.

This water is clear, gaseous, and odourless, or nearly so, the numerous glasses which are placed after drinking on the circular slab which sur-

rounds the spring, are lined with incrustations of the salts left after evaporation: this attests the large quantity of salts it contains. This water, from the large percentage of lithia it contains, in combination with the soda and potash salts, is most valuable in all cases where gouty manifestations are present; it is easily borne by the stomach, and patients soon overcome the slight nauseating effect of its temperature; in fact almost all, after three or four days enjoy the drink, and find it soothing and pleasant, its high state of mineralisation—nearly 40 grains of solids in each litre, and its temperature 35·2° Cent. = 96° Fah.—renders it a most valuable and agreeable water for bathing purposes, and has certainly contributed largely to give Royat its reputation as a Thermal Bathing Station.

CÉSAR SPRING.

This abundant spring, next to Eugenie in thermality, marks 25·5° Cent. = 83° Fah. The

large quantity lately discovered allows of its being used also for bathing purposes. This water is less mineralised than the preceding; it contains a much larger amount of free carbonic acid gas, and is therefore one of the most appreciated waters for drinking, either alone at the spring, or at the table mixed with the country wine. It thus becomes a pleasant beverage, and will bear keeping in bottle for a considerable time without losing its properties. I have recently tasted some that had been in bottle for sixteen months (as an experiment) which I found still to contain some carbonic acid, and not at all unpleasant to drink. The amount of deposit was small.

SAINT MART SPRING.

This spring has been known for many years, and is mentioned by some of the old writers. It was lost for about forty years; having been covered up by an inundation in 1835.

Seven years ago it was found again, and is at

present in full play. Its mineralisation resembles somewhat that of Eugénie; its temperature differs, not exceeding 30° Cent. = 86° Fah. It is wrongly called an intermittent spring. The amount of water is the same, but it occasionally throws out large bubbles of carbonic acid gas, which last for a minute or two and then subside. This phenomenon is, no doubt, the result of accumulated gas in the upper part of the irregular channel through which it runs; the gas goes on collecting until the quantity becomes so great, that in order to find an escape it forces itself through the column of water, thus causing this curious phenomenon.

This valuable water is very clear and rich in carbonic acid, which accounts for the perfect solubility of its various salts. It is largely used as a drink mixed with wine, and can be easily exported, keeping good for a long time. It is much frequented by persons who, though not under treatment, take an occasional glass, which sharpens their appetite, and prepares their stomach for an easy digestion.

SAINT VICTOR SPRING.

This spring constitutes one of the most valuable springs of this group of waters. The last analysis made by Mons. Willm, and repeated by Professor Carnot of the Paris School of Mines, shows that its temperature is 20° Cent., or 68° Fah. It contains more salts of lime and potash than the other waters. It possesses also a larger percentage of iron, and contains 4½ *milligrammes* of arseniate of soda. It is enclosed in a well-constructed Roman grotto, with a flat roof formed by small stones and cement. One Roman column in a perfect state of preservation, shows that the Romans attached considerable importance to this spring.

During the winter of 1881 to 1882 some excavations were being made over this so-called Grotto, when the workmen discovered extensive Roman works, the excavations were continued and a series of Roman baths were found, consisting of three large Piscines, or swimming baths, lined with pure white marble—Roman ovens for

heating air, and water, with channels leading to the surrounding galleries. These Roman Piscines, were admirably constructed, and showed how extensive must have been the knowledge of their builders, and what importance this great nation attached to the mineral waters; they evidently knew that air was a bad conductor of heat, and as they wished to preserve the waters with their natural heat as they emerged from the spring, they surrounded the Piscines by air chambers, and constructed one under each bath occupying the whole sub-surface of it, the so-called Grotto of St. Victor is nothing more nor less than a huge air chamber under one of these Piscines. The discovery of such extensive, and carefully arranged work, naturally enhances the value of these waters; it is natural to presume that should further investigations be made, extensive Roman remains would be discovered. It is to be hoped that the French Government will take up this very important subject.

I shall draw particular attention to the value of this spring when treating of the diseases in which these waters are employed.

THE BATHING ESTABLISHMENT.

The baths, and all the other modes of applying the mineral waters, are enclosed in a building 80 metres long. The frontispiece which occupies the centre of the building, has three wide entrances leading into the vestibule. In front, at the entrance, is the the office where tickets are obtained for the different kinds of appliances, ordered by the physician: on either side of the vestibule are galleries, one to the right for ladies, the other on the left for gentlemen; each gallery containing 26 bath rooms, with baths made of marble, volvic stone, and enamelled iron. At the end of each gallery a special portion is arranged for the spray-producing machines, or pulverisers; and the carbonic acid gas bath and douches. A dressing-room is attached to this department. On each side of the vestibule a staircase leads up to the aspiratory rooms, where the patients sit in amphitheatre, and at different heights round a large tube, like the funnel of a steamer, out of which the mineralised

steam is ejected in clouds. Another stair leads down to other galleries to the right. Another gallery with 26 baths and hot douches. At the end of this there is a large swimming bath also of running mineral water called the *Piscine.* This large basin has the shape of a parallelogram presenting a surface of 130 square metres of thermal water. The depth is graduated by an inclined plane, so that children can enter without fear. At the further extremity of this bath, the depth is about 6 feet, so that one can easily plunge and swim. In the centre over the water a gymnastic apparatus exists, which many patients use with pleasure and advantage. A swimming master is attached to this department which is open in the morning to ladies, and in the afternoon to gentlemen. On leaving the Piscine, the bather is supplied with a warm peignoir and towels before entering his dressing room. On either side of this building is a hydropathic establishment, one for ladies, and another for gentlemen. These are well arranged, and afford ample means for using hot or cold water, separately or combined.

Two spacious and well-furnished ante rooms

opening into the gallery on either side of the principal entrance are used by bathers who are waiting for the preparation of their bath, or getting cool before going out into the open air.

A smaller bathing establishment has been formed since the discovery of a large supply of water from the César spring; the temperature being much less than the Eugénie, and highly charged with carbonic acid gas, renders it a most invigorating and delightful bath. A comfortable couch for the massage or kneading process is fitted up in a cabinet close at hand where the patient can be submitted to that treatment on leaving the bath.

THERAPEUTICS.

The study of the chemical composition of the four mineral springs at Royat will show that we have several powerful agents at our command, and that much is available for the treatment of many morbid conditions, which resist the usual pharmaceutical applications we make use of in

daily practice, and when it falls to our lot to see the extraordinary effect of these agents, properly managed, on many intractable cases, we are not surprised to find so many people flocking every year to the health-giving springs. I shall therefore tabulate the most important maladies which are amenable to treatment by these mineral waters.

The Royat waters act strongly on all atonic diseases. The various kinds of anæmia, chlorosis, and debility of special organs, or of the system in general, will find in the ferro-arsenical spring an active and powerful medicine: but that which constitutes their great virtue, and I may say their speciality, and which distinguishes them from all other springs, is their peculiar action on all diseases which derive from a gouty habit, this action they owe to the properties of lithia, which is considerably increased by other mineral products in comdinution with it.

A celebrated French dermatologist; Professor Bazin, was the first to point out the numerous varieties of symptoms which result from gout, it was he who gave the name of arthritism, which he

defines as a special tendency of the system to produce abnormal quantities of uric acid, and salts of this acid, the presence of which in the different tissues, produce divers serious manifestations, most frequently painful, and which often resist with great tenacity the different treatments applied to them, among these, the most important are gout, gravel, divers forms of rheumatism, not only those which affect the limbs and joints, but also those which invade the visceræ (stomach, lungs, liver, intestines, kidney, and bladder), finally that uumerous class of skin affections which owing to their origin have been called "*Arthritides*" (exzema, pityriasis, psoriasis, hydroa vacciniform, and sycosis).

In a healthy organism, where all the physiological functions, are in a perfect state of equilibrium the elimination of the different residues which arise from the constant wear and tear of tissues, is made in a methodic, uniform, and always complete manner, by the urine, by perspiration, and by the pulmonary expiration. The nitrogenous compenents, under the influence of intimate oxidations follow a series of chemical evolutions of which the

last stage is urea, the most oxidised of all the products of decomposition of our system; owing to its great solubility it is easily eliminated by the urine, and by perspiration. The tertiary, or non nitrogenous compounds, are transformed by the action of oxygen into carbonic acid and are ejected by the lungs during expiration. Our tissue elements depend upon this regularity of action, and when from some cause or other the regularity of these chemical operations is disturbed, an abnormal condition arises, and a disease is started.

If the result of this cause, by diminishing the intensity of these oxidations, has been to modify the constant, and necessary proportions between the quantity of oxygen taken in, and the quantity of nitrogenous substances to be eliminated, the series of chemical evolutious, is no longer followed out by the organic products of waste: the oxygen failing, the final result is only a product incompletely oxidised, forming one of the penultimate forms of the series, *Uric Acid.*

This product possesses unforunately the property of forming with a certain number of bases, which it finds on its way, salts, which are either very

little soluble, or totally insoluble which pass with great difficulty through the renal filter, and get deposited in the tissues. It is this uric acid diathesis which produces symtomatic manifestations of divers natures the sum total of which constitutes *Arthritism.*

Numerous, and conclusive studies already of old date, have proved the great affinity that lithia has for uric acid, with which it forms a saline compound of great solubility, and which is easily eliminated from the system by the urine, and by perspiration.

Dr. Garrod's celebrated experiments on the solvent action of various alkaline solutions (potash, soda, and lithia) on the uric acid compounds are well known, and prove that lithia is the most powerful of all the alkalies, in dissolving the uric acid compounds. From the above statements, it is rational to conclude, that the lithia salts are those which ought to be administered in the treatment of all arthritic affections, these salts owing to their special affinity, have the power to dislodge in the system the uric acid from its insoluble compounds, and by a double chemical decomposition, produce

soluble urates which carry away in the excreta those abnormal products which poison the system. The utility of the Royat waters which contain lithia in a high degree, is amply demonstrated as regards the action of lithia on the uric acid compounds, but what renders them so much more valuable is the presence of other chemical agents so admirably combined which increases their power.

In almost all gouty individuals we find functional disorder of the stomach, causing a profound disturbance of its digestive, and assimilating powers, this naturally reflects on the phenomena of nutrition in other organs; alkalies are given in small doses so as to modify these functional dis-disturbances, they activate the secretions, increase the quantity of gastric juices, and by this means assist absorption. We have in the Royat waters besides the lithia, two other alkalies potash and soda in the shape of bi-carbonates, these three salts combined prove most effectual in rousing the gastric functions, which together with the pure mountain air, and plenty of exercise aids considerably in the treatment of gouty dyspepsia.

We must, however, not loose sight of a most important question, and that is the prolonged use of alkalies, and particularly the salts of soda which alter the composition of the blood: this alteration after a while produces the alkaline cachexia, which I have frequently observed among patients who have been submitted to a prolonged treatment at Vichy, Vals and Vidago. At Royat nothing of this sort is to be feared, for in combination with the alkaline salts above mentioned, we have chloride of sodium, carbonate of lime, iron, and arsenic, which by their tonifying effect, and blood-nourishing properties prevent the debilitating effects of the others; we obtain by these waters all the effects we require from the alkaline treatment, without running the risk of weakening or depressing our patients, they may in fact be called a perfect chemical food. The constant supply of the thermal mineral water is a considerable aid in the treatment of gout, the immersion of the body in a bath supplied with a constant flow of running water direct from the spring, and highly charged with its natural carbonic acid gas is not only luxuriant in the extreme, but highly

beneficial. I therefore need not insist any longer in showing the value of these waters in all arthritic cases. I shall therefore conclude this first part of the work with a few remarks on the use of two springs in another class of cases which also derive immense benefit at Royat. There are cases of anæmia, chlorosis, and general debility, as also of a peculiar class of nervous, and hysterical females, whose nerves are unstrung, and to use their own expression are fit for nothing. In these cases the use of the ferro-arsenical water taken internally, and the cool and highly charged carbonic acid bath properly given, produces remarkably rapid improvement, it is worthy of note that this bath from the large quantity of gas it contains is in some cases so stimulating that young females of an excitable nervous temperament cannot stand it, they have therefore to be prepared by a gentle course of plain cold water cure, in the shape of douches before they can attempt the mineral bath.

RESPIRATORY FUNCTION.

One of the most distressing and not unfrequent symptoms which some gouty patients suffer from is dyspnœa. They generally complain of wheezing at night, which interferes with sleep, and is a source of great discomfort. This symptom ceases after a few days at Royat. Some men of experience pretend that it is owing to the carbonic acid gas which is being constantly evolved from the waters, and the surrounding ground. Others say it is to the peculiar equability of the temperature, and mildness of the climate. Others again attribute it to the effect of the waters. I fancy that there is some truth in all these assertions, and all contribute to the benefit derived. The stiff, swollen, and painful joints improve quickly under the influence of the prolonged warm bath, with massage, followed by a mineral water poultice. This application which I frequently use consists in wrapping up the joint in a piece of flannel

well soaked in the warm mineral water (Eugénie spring) and covering it with a piece of gutta percha sheeting—spongio piline answers the purpose well. I saw one patient who, on arriving at Royat, could not walk for more than ten minutes without considerable pain. After his 25th bath, he walked six miles with the greatest ease. His feet and ankles were reduced in size, and were quite supple in their movements. Cases of bronchial catarrh, accompanied or not by asthma, also derive considerable benefit by the aspiration of mineralised steam, these inhalations are carried out in a room in the shape of an amphitheatre, surrounded by benches placed in rows one above the other up to near the ceiling, in the centre of the room. A metal tube like the funnel of a steamer, rises above the ground for about seven or eight feet, throwing out clouds of mineralised steam; the patient sits down, inhaling from a quarter of an hour to an hour according as the case may be; and of course the higher he is placed, the more steam he gets; the patient during this process is deprived of his coat, waistcoat, and trousers, and is wrapped up in

a flannel dressing gown. On leaving the inhaling room, he passes into an outer room warmed by steam or hot water, and there dresses slowly. Should there be any headache, the patient is ordered to take a hot foot bath for a few minutes before dressing. The inhalation followed by a hot bath is often most useful. From the establishment he goes home, either on foot or in a sedan chair, and rests for an hour until breakfast time.

Throat cases are treated locally by pulverised mineral water. This is accomplished in a special room, surrounded by different kinds of silver plated pulverisers which are put in action by a force pump. The patient puts on an india rubber apron which fits round the neck, and hangs down the front of the body, protecting him from the spray. He then sits down opposite the apparatus and receives with open mouth the pulverised water. In another adjoining room, the neuralgic patient receives different sized douches of carbonic acid gas. A large bath for applying the gas on the whole surface of the body also exists, and I am told relieves neuralgia very considerably. I have

not seen any cases which have undergone the general gas bath treatment, but I have seen a few who have had the gas douche applied locally for frontal neuralgia, with marked relief; in many cases the relief is almost instantaneous.

All these waters are powerful medicinal agents; each has its special action, and it is only necessary to select proper cases for treatment, and to use a certain amount of sound judgment to obtain satisfactory results.

The hydropathic establishment affords ample means of applying hot and cold water, alternately, or combined in suitable cases for treatment. I have found in some exceptional cases where patients felt depressed, either by the thermal treatment, or from exposure to excessive heat, that the Scottish douche braces them up, and prepares them for their departure.

CLIMATE.

The position Royat occupies in a vallley surrounded on all sides except the east, by mountains

of various heights, its altitude above the sea level, 1,480 feet, the luxurious vegetation which abounds on all sides, its, particularly dry atmosphere and soil, with an equable warm temperature, is sufficient to impart even to the less acquainted with meteorology, a pretty correct idea of its climate, which can be summed up as temperate, dry, and bracing. This fact is of very great importance to those who are undergoing a water cure, for it allows them to take any amount of exercise in the open air, without fear of taking cold, or exposing themselves to excessive heat, which is frequently the case in the cold elevated region of Mont Dore, or in the low hot plain of Vichy. The vegetation of Royat and its neighbourhood is very remarkable; it abounds in fruits of every description, and of a very superior quality. At Clermont large establishments for the manufacture of fruit pastes, especially the pâte d'Abricots, exist, and I am told that the produce of that article alone amounts to five millions of francs per annum. Cherries, peaches, and strawberries of great size and beauty abound, and roses are par excellence —the flower of Royat.

The Puy-de-Dome belongs to the Sub-Alpine Region, and is occasionally visited by clouds and thunder-storms, followed by copious rain. These storms generally come on at night, and seldom last more than two or three hours, sweeping away the clouds and leaving a clear sky and bright sun, with a cool atmosphere for the following day. It would be safe to select the following day after a storm for an excursion to the surrounding mountains. Two years ago we had four storms during the season, all of which occurred between nine and ten o'clock at night. Independently of the value of its thermal springs, Royat is one of the most pleasant places of resort for those who require a change. Among the numerous visitors who came last year to Royat, several distinguished physicians French and foreign were seen taking their holiday, and all seemed much pleased with everything they saw, and partook of. Few places can boast of so many advantages. The geologist, the botanist, the artist, the archæologist, and the general tourist will find ample means for study, pleasure, and exercise in this mountanous and volcanic region of Auvergne.

Ample means are provided for locomotion, and for those who cannot take long walks. Horses, carriages, ponies, and donkeys can be had at reasonable prices. Like all the principle watering places in France, Royat has its music in the park every afternoon, and an excellent casino for evening amusement. A good theatre, reading room, billiard and card room, and a restaurant. The hotels are good, and well served, and for those who prefer it, a good selection of private villas, and cottages well furnished is to be had.

I cannot help mentioning some of the most favourite excursions worthy of a visit.

First to the town of Clermont Ferrand, where the visitors will find the cathedral; a fine specimen of Gothic architecture of the thirteenth and sixteenth centuries. Splendid specimens of old stained glass for which Clermont is still celebrated. Notre Dame du Port, one of the most beautiful types of Roman architecture in Auvergne. Close to the church is the Place Delille, where the first crusade was preached, 1095. Lecoq's public garden and museum are worth a visit. The latter contains a remarkable collection of botanical,

geological, and ornithological specimens. Also a large library, and a collection of medals and coins, several remarkable pieces of antiquity of the age of stone, curious arms, and remains of the Roman temple dedicated to Mercury on the summit of the Puy-de-Dome.

The petrifying cave of St. Allyre is a curiosity worth a passing visit. Up the valley of Royat numerous excursions are available; the visitor, however, should stop at Gravenair, Pepinière, Fontanas, the valley of Villars, and the Roman road, Boisejour and the Beaumont.

At a greater distance, excursions on horseback or carriage to Gergovia, where Cæsar was defeated by the Gaul Vercingetorix. The quarries of Volvic, the old castle of Tournoel, and the thermal springs of Chatel-Guyon. The Puy-de-Dome, which every traveller ought to visit from base to summit, is one of the most interesting mountains in France, standing erect in the midst of a series of extinct volcanoes, and at a height of 4,842 feet above the level of the sea, one enjoys from its summit one of the grandest panoramic views in Europe. The remains of a Roman temple

dedicated to Mercury are very interesting. The observatory is also worthy of notice. From Royat the drive to the base (Col de Ceyssat) takes about two hours and a half through a very lovely country; from the Col to the summit an hour's walk. Ladies who do not feel up to the walk can drive up in a kind of dog-cart drawn by two horses and a mule, but the walk is much preferable, as from the winding path which leads you to the top, a variety of charming landscapes are continually unfolding themselves to the view. A word of caution to the visitor will be acceptable, before attempting the ascent, consult the barometer, and see that the Puy-de-Dome has his hat off. The Auvergnat gives this name to a black cloud, which hangs over the summit of the mountain, and which is a sure sign of rain. Anyone taking an interest in the scenery, and the beauties of Auvergne must read Herbert de Kontzow's charming little work "Summer Days in Auvergne."

Like most watering places, Royat has its three epochs during the season. The first begins as soon as the fine weather sets in, and therefore varies between the end of May and the 10th of

June, ending on the 15th of July. This season is generally less crowded than the second, which lasts from the 15th of July, to the 25th of August. This is called the fashionable season; it certainly is the warmest and the most crowded. The third and last begins on the 25th of August, and lasts until the weather begins to break, and cold sets in. It is not unfrequent to find fine weather lasting throughout the whole of September, and those who are not pressed for time, will find it a most enjoyable month. As a rule, invalids who go for the third season remain as long as the weather allows them, not limiting their cure to a certain number of days. Those invalids who intend proceeding South to some winter resort would find advantage in coming to Royat during the last season, as they would not require to return to England, they would in fact find it an excellent climate of transition between England and the South of France or Italy.

Having given in the preceeding pages an idea of the climateric conditions, and the value of the mineral waters of Royat, I do not think it out of place to add a few words in regard to

this locality as a sanitarium for children, who either from hereditary disposition, or acquired tendency, to scrofula, are anæmic, dyspeptic, weak and stunted in their growth. Several very striking instances have presented themselves to my observation in which these symptoms were present, and in which a sojourn of two months at Royat proved highly beneficial.

Dr. Blatin, a distinguished physician and professor at the medical school of Clermont, was kind enough to show me several cases of children, who had been for years in this condition, and whom I found strong and healthy. This physician has established at Clermont a gymnasium which he himself superintends, and which, under the proper guidance of an accomplished master, has several hundred pupils. The advantages obtained by a thorough methodical training have produced remarkable results, not only in developing the muscular frame of the healthy individual, but also in improving the health of weak and strumous children. I have no doubt that if children were, under proper guidance, submitted to a course of treatment by the ferro-arsenical waters, the bracing

and pure mountain air, good food, and a methodic course of gymnastics, great results would be obtained, not only by invigorating the healthy, but also by arresting disease, and changing the constitution of the sickly, and weak generation.

A very fine gymnasium has just been erected at Royat, it forms part of the bathing establishment, and is directed by a very able master, every requirement necessary for aiding the thermal treatment in many cases of disease, has been duly considered.

TABLE No. I.

Analysis of the Royat Waters by Ed. Willm, 1879.

Barometric Height, 728 millimetres.

	Eugenie.	Saint Mart.	Saint Victor.	Cesar.
	Cent. Fahr.	Cent. Fahr.	Cent. Fahr.	Cent. Fahr.
Temperature	34·2 93·2	29·5 84 2	21·3 69·8	28·5 82 4
Free Carbonic Acid	1 grm., 3955	1 grm , 5524	1 grm., 7508	1 grm., 8188
Silica	0·1026	0·0958	0·1050	0·0815
Alumina	,,	0·0027	,,	,,
Carbonate of Lime	0·7706	0·6172	0·7058	0·4540
,, Magnesia	0·3497	0·4359	0·4519	0·2560
,, Iron	0·0518	0·0141	0·0420	0·0340
Arseniate of Iron	0·0008	0·0010	0·0021	0·0008
Carbonate of Soda	0·7374	6·6611	0·6777	0·3871
,, Potash	0·1423	0·1560	0 1564	0·0984
,, Lithia	0·0322	0·0229	0·0246	0·0191
Sulphate of Soda	0·1643	0·1482	0·1612	0·0893
Chloride of Sodium	1·6728	1·5930	1·6479	0·6528
Total ...	4·0297	3·7480	3·9746	2·0249
In the Form of Bi-carbonates.				
Bi-carbonate of Lime	1·1183	0·8888	0·9164	0·6538
,, Magnesia	0·4996	0·6226	0·6456	0·3657
,, Iron	0·0740	0·0194	1·0580	0·0462
,, Sodium	1·1687	0 0478	1·0732	0·5343
,, Potassium	0·2070	0·2260	0·2269	0·1484
,, Lithium	0·0592	0·0421	0·0453	0·0351

School of Mines Essai Department.

TABLE NO. II.

Research for Arsenic in the Mineral Waters of Royat.

	Saint Victor.	Cesar.	Saint Mart.
Arsenic	0·0011	0·0002	0·0004
or Arsenious Acid ...	0·0017	0·0003	0·0006
or Arseniate of Soda	0·00457	0·00083	0·00166

The Director of the Essai Department,
A. Carnot.

OBSERVATIONS.

I.

Eczema of Arthritic Nature.

Miss S——, English, of a gouty family, suffered for three years, from severe eczema on both feet, affecting chiefly the toes; was under treatment during the whole of the time for skin disease, took arsenic, iron, iodide of potassium, cod liver oil, etc., without any permanent result. The last physician she consulted suspected gout might be at the bottom of the ailment, and sent her to Royat; she entered my room, supported by her father and sister, and was suffering from great soreness and pain; on the 10th day after treatment the skin was all but healed; itchiness, soreness, and pain had disappeared, and she walked from the basis, almost to the top of the Puy de Dome; on the 21st day of treatment she went to a ball, and was able to dance until 2 o'clock in the morning. This improvement lasted until the

month of May in the following year, when a small spot appeared on one toe, she returned to Royat and went through another cure, and has been since perfectly well.

II.

Acnea Rosacea, with obstruction of nasal passages and granulated Pharynx—Gouty origin.

Mr. M——, aged 36, of spare and temperate habits, had been under various treatments for what was supposed to be syphilis; in spite of a mercurial, and non-mercurial treatment, his symptoms persisted, and at last he came to Royat, simply to see Auvergne, and breathe pure mountain air; it was with some difficulty that I could persuade him to undergo a small cure, his unbelief in anything that could be done for him, was almost invincible, having lost all faith in everyone, and in everything; he, however, at last consented, on condition, that if he were not better in a week he would leave the place; by the use of the waters taken internally, and in baths, and with the daily use of the spray in the shape of

nasal and pharyngeal douches, improvement began on the third day and continued steadily until he left, having only submitted to fifteen days treatment. On leaving he could breathe freely through his nose, his throat was smooth and healthy looking, and his groggy nose was as he said quite handsome again.

III.

Psoriasis Palmaris—Gouty subject.

Mrs. M., English, of a gouty family, lives in the country, had been suffering from psoriasis of the hands for the last five years; divers treatment had been used without any success; latterly she had been using an ointment composed of chrysophanic acid, (a drachm to the ounce) of vareline, this was ordered to be rubbed in four times a day. The result was that very soon after, the acid passing through her skin turned it of a dark colour, and literally destroyed her under linen, stays, and even the lining of her boots; in spite of this severe treatment, the disease was still present, in fact slightly aggravated. After three weeks, treat-

ment at Royat, the skin became clear, the dark appearance of the nails still persisting to a small extent; all pains and soreness had gone. The palms of the hands were somewhat shrivelled, but no sores or scales were visible. Besides the usual interest in a case of gouty psoriasis, this one presented to me quite a novelty in the shape of a human being saturated with chrysophanic acid.

IV.

Mrs. L., English, proceeds from a gouty family, and has had for the last two years bronchial catarrh accompanied by distressing dyspnœa. Went to Madeira for one winter, where she improved slightly; came afterwards to Royat and underwent a complete cure of thirty days. The treatment consisted chiefly in the use of the flowing bath, and aspirations of mineralized steam, at the same time drinking the mineral water at spring; after a few days' treatment the quantity of uric acid expelled was very great. Cough, expectoration, and dyspnœa, almost entirely disappeared on the twentieth day by the end of the cure; dysp-

nœa had entirely left her, and the only symptoms which existed were slight morning cough, with frothy expectoration.

V.

Monsieur D——, a Frenchman, aged 49, has lived in Havanna for many years, suffered from bronchitic asthma and anæmia.

Arrived at Royat on his way from Mont Dore, where he underwent a cure of twenty-five days; no result as regards his bronchitis and asthma; anæmia more pronounced, and feels much prostrated; came with the intention of only drinking the waters to combat his anæmic condition, and get up his strength; was persuaded to undergo a short cure by aspirations; at the end of ten days, chest symptoms had almost entirely disappeared, better colour, feels stronger. Went out on a cold wet night, and had a slight relapse, continued aspirations for another ten days, feels quite well, no rales in chest, breathes freely, appetite excellent, can take exercise without tiring. This case illustrates the advantage of undergoing a

treatment of hot baths and aspirations at Royat, where the climate is much milder than at Mont Dore, patients are not so liable to take cold, besides which the tonifying effects of the ferro-arsenical spring greatly assist the internal treatment, where anæmia and general debility are concommitant symptoms.

VI.

1880.—*Gout and Diabetes Mellitus.*

Mr. W——, aged 64, large build, unhealthy and bloated appearance, pulse weak, superficial circulation stagnant, laboured breathing on taking exercise. Urine contains 87 grammes of sugar per 1,000 grammes, three weeks' treatment; after which 1,000 grammes of urine gave 47 grammes of sugar. Four months after, the patient writes,—"Royat, great success, feel better than I have done for the last twenty years. Hunt as I did when a youth, shall return next summer." 1881. Returned in much better condition than last year, though urine still contained 64 grammes of sugar per 1000, three weeks' treatment, sugar descended

to 35 grammes; patient indulges too much in forbidden food, and therefore has not derived all the benefit he ought to have done; feels well, can take exercise without fatigue, breathes freely, flesh harder. 1882. Returned to Royat, general health better than last year. Sugar in urine 54 grammes, ten days after treatment sugar descended to 10 grammes per 1,000; twenty-first day 12 grammes. Orthopœdic gymnastic at the board did much good in eliminating uric acid, and improving the general tone of the body.

VII.

Diabetes Mellitus, profound Anæmia, extreme Debility, Dyspepsia, Albuminuria.

Mrs. L——, aged 58, arrived at Royat in a semi-collapsed state; the people at the hotel were afraid of admitting her, thinking she might die during the night. After forty-eight hours repose, she revived, urine contained 54 grammes of sugar, began treatment, at the end of ten days the quantity of sugar went down to 10½ grammes per 1,000. General health much improved, could

walk short distances without fatigue, colour appearing on skin, appetite good.

Twenty-first day of treatment, sugar disappeared altogether, albumen only traces, stomach digests well, feels much stronger, colour much improved; this lady went by the name of "*La Ressusciteé.*"

VIII.

Arthritic Eczema of Legs, Arms, and Feet.

Mr. S——, English, of gouty parents, has suffered from eczema for the last two years, occasionally getting better, but no lasting improvement. Soreness of feet prevented his taking exercise, began mending after the seventh bath and water drinking, could already walk two miles without feeling his feet, voided large quantities of uric acid for about a fortnight, after which it began to diminish. All patches disappeared with the exception of one on the calf of left leg. Sent him for an after cure to La Bourboule, where he made a short cure of ten days; on his return the patch had entirely disappeared.

IX.

Severe Eczema of entire Hands, Fore-arms, and Legs—Of decided gouty origin.

Sir W. D——, has been suffering for several years from this disease, has tried internal and external treatment at home, and has been to many watering places abroad; latterly at Gastein which aggravated the disease to a considerable degree; despairing of being able to find relief by mineral waters, was at last with great reluctance induced to try Royat. At first this case resisted most tenaciously, but improvement showed itself slowly, and at the end of three weeks a decided change for the better took place; all sores healed up, the red and angry appearance of the skin disappeared, the agonising burning and itchiness ceased, and new tissue began to form; an after cure of a fortnight at La Bourboule seemed to have consolidated this improvement. I have no doubt that a regular régime this winter at home, and a renewal of the treatment next year will complete the cure.

I might add numerous other cases of the same

description, amongst others two cases of very tenacious pruritus vulvæ et ani, which had baffled all treatment at home, and which entirely disappeared at Royat; they were evidently of gouty origin. I think however that these observations are sufficient proofs of the efficacy of these waters, in a variety of chronic cases, where a gouty diathesis is present, though at times it is not manifested in any other way, and is therefore most difficult to diagnose.

THE SPECTROSCOPIC EXAMINATION OF LITHIUM IN THE MINERAL WATERS OF ROYAT.

It is a well known fact that a ray of sun-light passing through a prism, is decomposed into a series of colours of varying refrangibility, producing the colours of the rainbow; on examining carefully we find that these colours are separated by dark rays, which are called Frankenhofer's rays from the name of the physicist who observed and described them; some of the principal dark rays are depicted in fig. 1. If instead of using the sun's rays, we use a gas light, we neither see the bright colours, nor the dark rays; but if we place in the light a small quantity of salt (chloride of sodium) at the end of a platinum wire, we immediately perceive a yellow ray at exactly the same place D of the solar spectre, this is called the sodium spectre, fig. 2. If instead of salt we place at the end of the platinum wire a small drop of a solution of chloride of lithium, instead of a

FIG.

FIG. 2.

FIG 3.

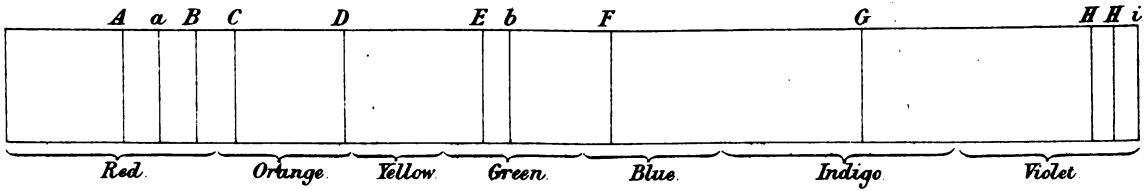
[illegible]

[illegible]

[illegible] a [illegible] a [illegible] of varying [illegible] the [illegible] of the [illegible] called [illegible] the [illegible] of the [illegible] [illegible] neither [illegible] colours, [illegible] of [illegible] place in the light [illegible] of [illegible] at the end of [illegible] plate [illegible] mediately [illegible] at exactly the same [illegible] of [illegible] is called [illegible] spectrum, fig. 2. If instead of [illegible] we place at the [illegible] of the [illegible] with a small drop of a [illegible] of [illegible] of [illegible], instead of a

PRINCIPAL RAYS OF THE SOLAR SPECTRUM.

FIG. 1.



Sodium Spectrum Na.

FIG. 2.

Lithium Spectrum Li.

FIG. 3.

yellow ray we see a bright red ray Lia placed to the left of the sodium spectre; if the lamp gives out a sufficient amount of heat, a second ray Lib of an orange colour will appear, this is the pure lithium ray, fig. 3. If other metals are placed in the light, other rays will make their appearance, each characterising by their unvarying position and colour the metal they represent. By means of this instrument we can by a previous knowledge of the position and colours of rays, each corresponding to a certain metal, know at once what metal we are dealing with. We can even go further, and tell within a few milligrammes the quantity of metal existing in the mineral water. Suppose we prepare beforehand a series of solutions of chloride of lithium, say for instance 5—10—15 up to 40 milligrammes to a quart of water, and then examine a drop of the natural mineral water with the spectroscope, and note down its duration, and intensity; and then examine by the same process a drop of one of the solutions, and compare it with the first; we soon obtain after a few experiments, the exact amount of lithium existing in the water.

The ordinary chemical processes of analysis confirm the exactness of the spectroscopic analysis.

Professors Kirchkoff and Bunsen have proved that by spectroscopic analysis, the eye can detect the presence of the nine millionth part of a milligramme of a lithium salt.

To the presence of lithia in the Royat waters, combined with other salts, is chiefly due the importance they have acquired in the treatment of gouty affections: it is therefore natural enough that researches should have been made in most mineral waters, to find this precious metal. The whole of the Auvergne region is remarkably rich in lithia, even the earth of the Limagne Valley contains between three and four pounds of this precious alkali, in a cubic metre of earth.

The following table will give an idea of the quantity of Lithia, contained in different mineral waters.

		Chloride of Lithium per Litre.
Chateldon		Traces
Chaudes Aigues		,,
Mont Dore		8 milligrammes
Vie sur Cère		8 ,,
Royat (Source César)		9 ,,
Royat (Source Romaine)		12 ,,
Clermont	Source des Salins ...	14 ,,
	Source de Jande ...	15 ,,
	Puits Loiselot... ...	18 ,,
	Puits Arlesien Boyer	20 ,,
La Bourboule		18 ,,
Saint Nectaire		22 ,,
Chatel Guyon		28 ,,
Medague (Eau de l'ours)		30 ,,
Sainte Alyre		31 ,,
Les Roches		33 ,,
Chateauneuf		35 ,,
Royat (St. Mart)		35 ,,
Royat (Grande Source)		35 ,,

Comparing the quantity of Lithia contained in the Auvergne springs and that of other regions in France and Germany, we find that those of Royat stand at the head of the list.

Eaux de Vals	Source St. Jean ...	15	milligrammes
	Pauline	15	,,
	Des Convalescents	18	,,
	Juliette	20	,,
Eaux de Vichy	Source St. Marie	18	,,
	Hopital	18	,,
	Grande Grille ...	20	,,
	Hautrive	20	,,
	Lardy	22	,,
	Des Celestins ...	22	,,
Ems	Augustaquelle ...	½	,,
	Victoriaquelle ...	1½	,,
Carlsbad		1½	,,
Baden Murquelle		29	,,

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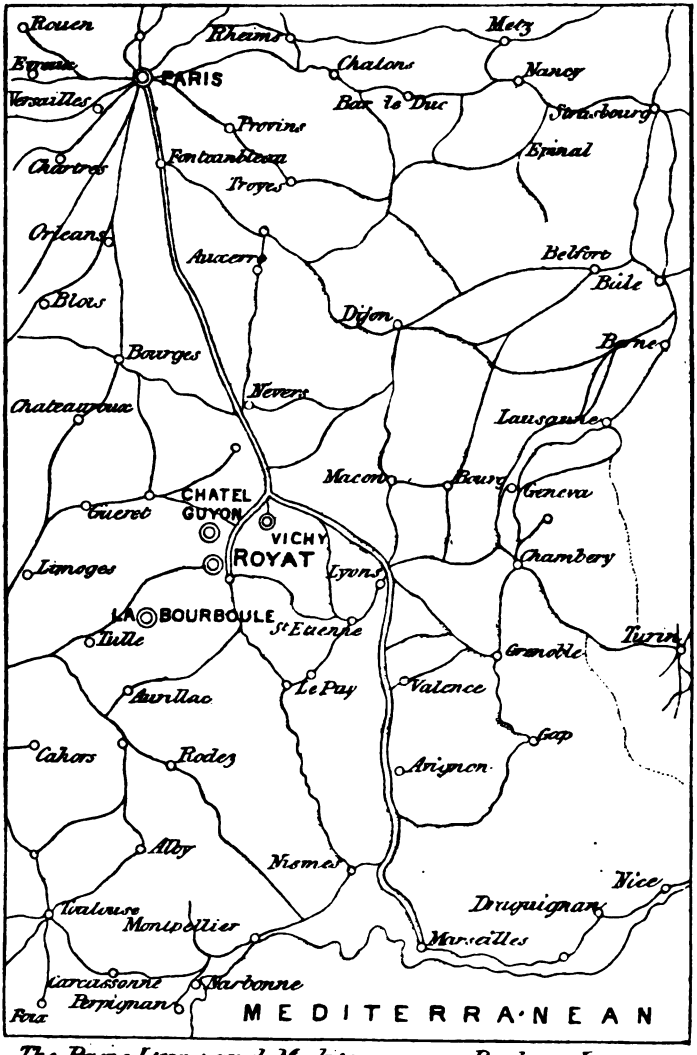

The Paris, Lyons and Mediterranean Railway Line